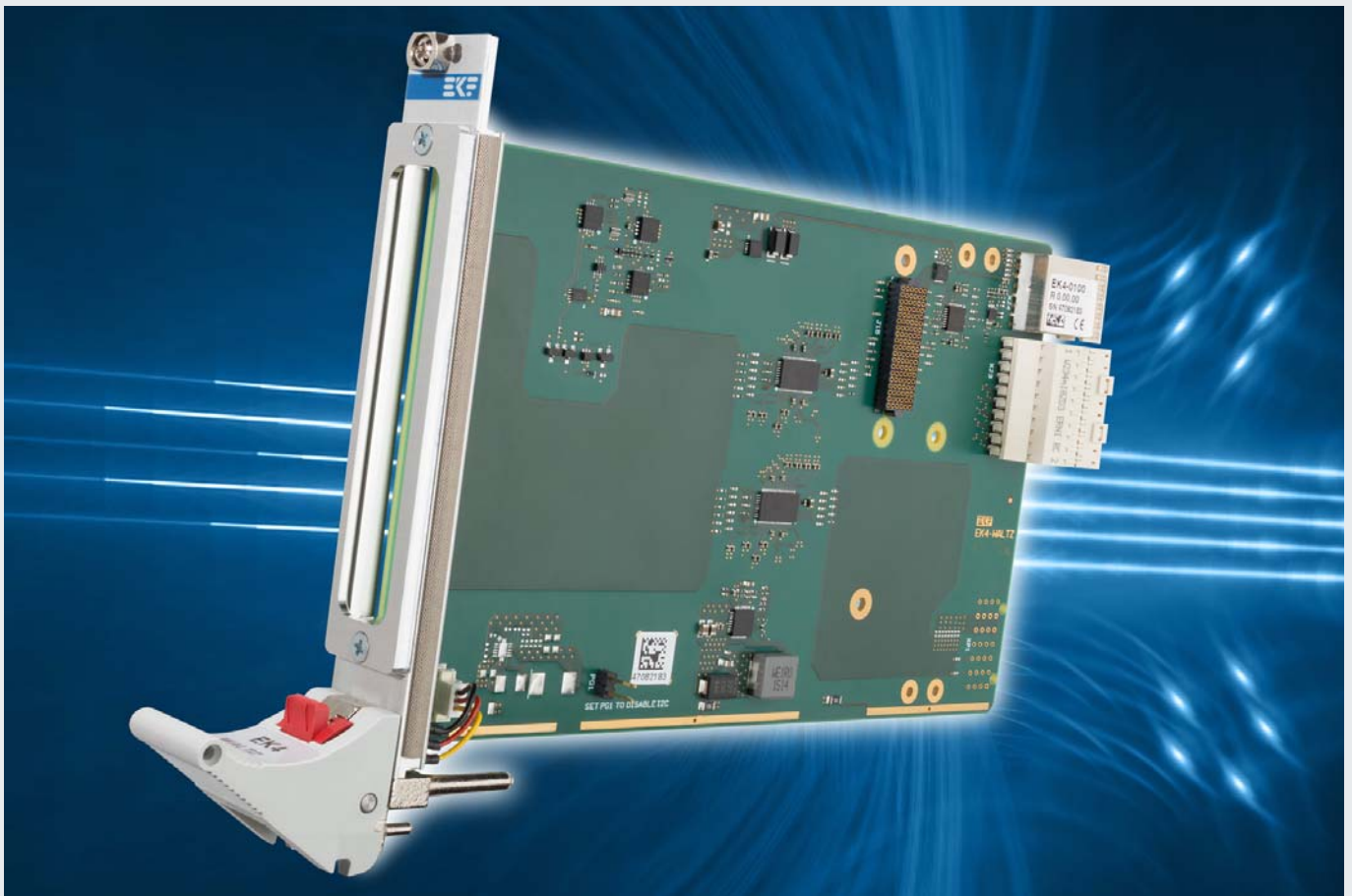# EKF

SYSTEM

Product Information

CompactPCI ® *Express* (PXI *Express* ™) • EK4-WALTZ

XMC Module Carrier PCIe® x8 • Full Length Module 74mm x 149mm

Document No. 8614 • 2 March 2018

General

The SK4-WALTZ is a peripheral slot board for CompactPCI® Express and PXI Express™ systems and acts as carrier card for an XMC-style mezzanine module. XMC modules are specified by ANSI/VITA 42, as an advanced replacement for PMC modules. While using a similar form factor as PMC cards, XMC modules are provided with a PCI Express® interface. The EK4-WALTZ can be used together with 74x149mm² full length or 74x139mm² short length XMC mezzanine cards.

The EK4-WALTZ is equipped with a bidirectional 8-lane PCI Express® Gen3 redriver, for optimum high speed signal integrity, and must be installed into a suitable peripheral slot e.g. Type 1 or Type 2 of a CompactPCI® Express (PXI Express™) backplane. The XJ3 connector supports any PCIe link configuration up to x8.

In addition, the optional XP1 power connector can be used to supply high current consuming XMC modules (requires Type 1 slot typically).

Feature Summary

General

▸ PICMG® CompactPCI® Express standard (EXP.0) peripheral slot card type 1 or type 2
▸ PXI Express™ peripheral slot card
▸ Single Size Eurocard 3U 4HP 100x160mm^2 with front extension
▸ Backplane connectors XJ3, XJ4 (type 2 peripheral slot)
▸ Option backplane connector XP1+12V power (type 1 peripheral slot)
▸ CompactPCI® Express backplane connector XJ4 with F2 key for CompactPCI® Express & PXI Express™ systems (F1 key available on request)
▸ PCIe x8 upstream Gen3 8.0Gbps via redriver
▸ Actual link size and transfer speed as result of XMC module link training

XMC Mezzanine I/F

▸ Suitable for 74x149mm^2 or 74x139mm^2 XMC modules according to VITA 42
▸ XMC module connector J15 (specified by VITA 42 as PCIe Gen1 interface)
▸ Option XMC 2.0 module connector J15 (VITA 61) recommended for PCIe Gen2
▸ 8 x PCI Express® lanes Gen1 (2.5GT/s as specified by VITA 42), Gen2 (5.0GT/s as specified by VITA 61) or Gen3 (8GT/s)
▸ 8-lane bidirectional PCIe Gen3 redriver/repeater for optimum signal integrity
▸ PCI Express® Gen3 clock buffer for optimum signal integrity
▸ +12V XMC VPWR
▸ -12V regulator option (J15 Pin F8)

Applications

▸ System integration of special functions not available as CompactPCI® Express card
▸ I/O controllers with front I/O connectors
▸ FPGA or GPU based parallel computing XMC modules

Feature Summary

Environment & Regulation

▸ Designed & manufactured in Germany

▸ ISO 9001 certified quality management

▸ Long term availability

▸ Rugged solution (coating, sealing, underfilling on request)

▸ RoHS compliant

▸ Operating temperature: -40°C to +85°C (industrial temperature range)

▸ Storage temperature: -40°C to +85°C, max. gradient 5°C/min

▸ Humidity 5% ... 95% RH non condensing

▸ Altitude -300m ... +3000m

▸ Shock 15g 0.33ms, 6g 6ms

▸ Vibration 1g 5-2000Hz

▸ MTBF 75.1 years

▸ EC Regulations EN55022, EN55024, EN60950-1 (UL60950-1/IEC60950-1)
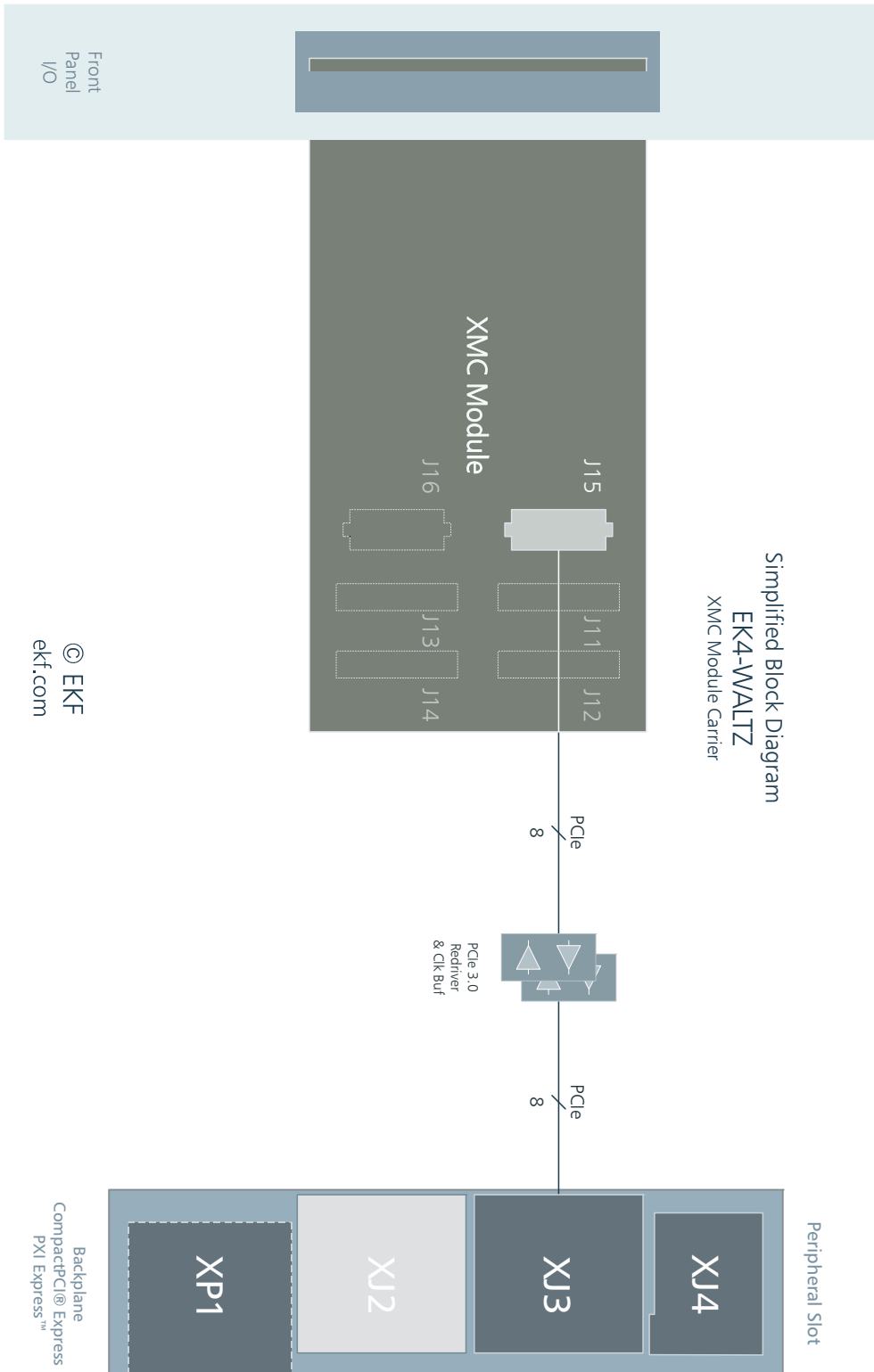
Theory of Operation

The EK4-WALTZ requires at least a single PCI Express® lane from the backplane, passed over across the CompactPCI® Express backplane connectors XP3/XJ3 to the on-board PCIe redriver circuit. Up to eight PCI Express® lanes are supported on-board, when the EK4-WALTZ is installed into a fully equipped CompactPCI® Express Type 1 peripheral slot (i.e. slot with a PCIe link x8 via XP3/XJ3). With a maximum link bandwidth of 64Gbps (PCIe Gen3), even very demanding applications can be realized, such as a 10/40GBps Ethernet or USB 3.1 Gen2 XMC mezzanine module e.g. The actual link width and speed established after the PCIe link training however will be defined by the backplane resources and the XMC module itself.

The on-board 8-lane bidirectional redriver is suitable up to 8.0Gbps (PCIe 3.0) data transfer rate per lane, and ensures optimum signal integrity (wider opening with respect to the eye diagrams). The XMC module connector J15 is directly tied to the redriver circuit. In addition, a zero delay PCIe Gen3 clock buffer is provided on-board. The EK4-WALTZ front panel is covered by a 2.5mm protruding metal frame, which allows 149mm full length XMC mezzanine modules to be accommodated.
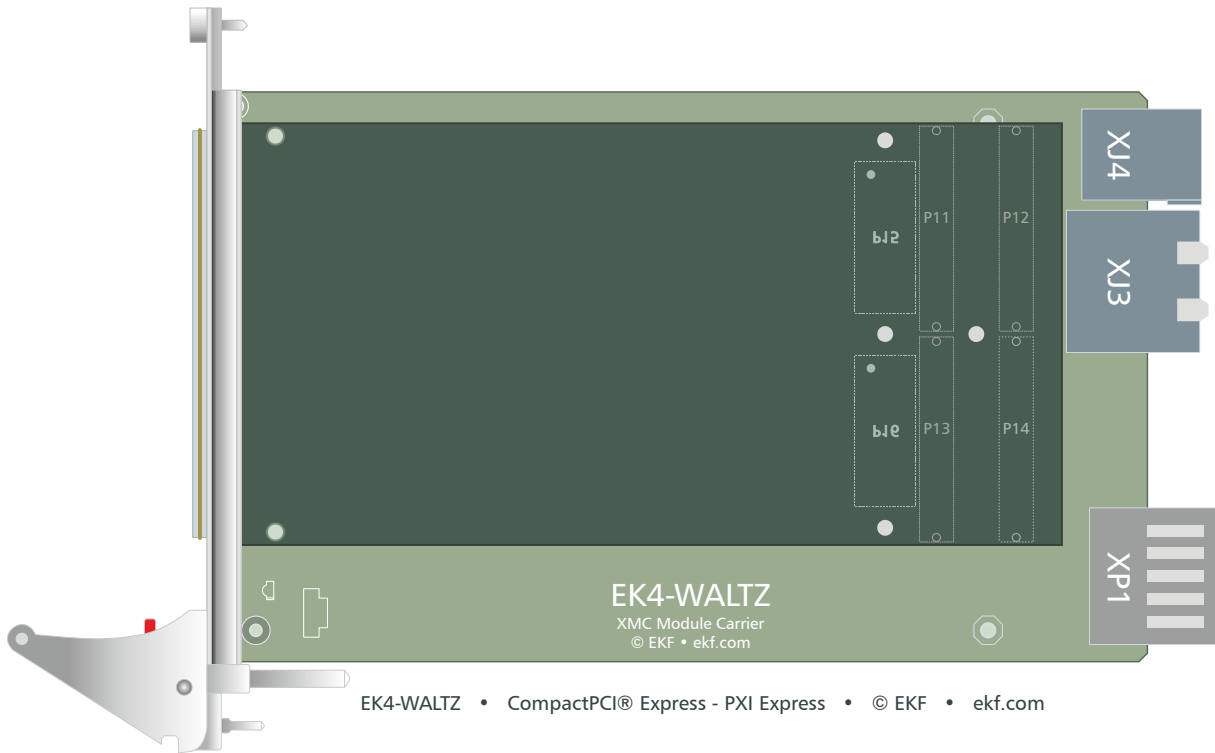
For higher XMC power requirements, the EK4-WALTZ can be optionally equipped with the XP1 blade connector, as defined for Type 2 peripheral slots.
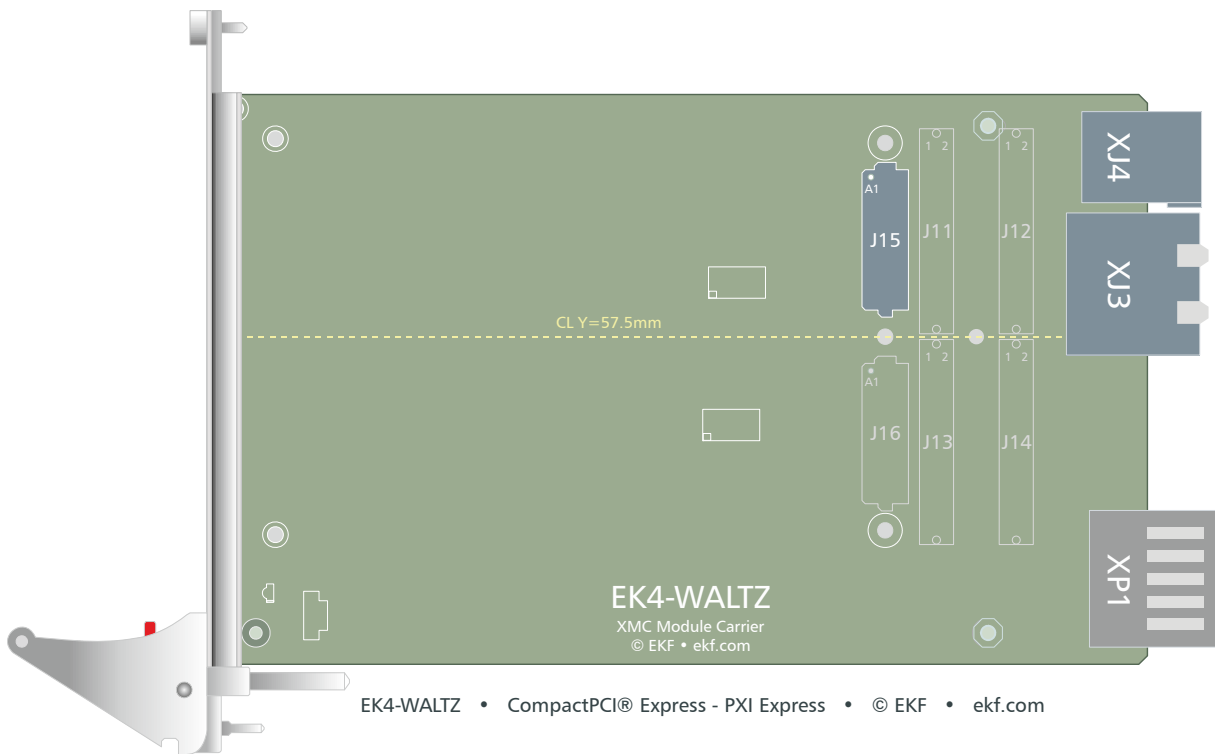
Block Diagram

XMC Module

J16

J15

J13

J14

J11

J12

Simplified Block Diagram
EK4-WALTZ
XMC Module Carrier

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ekf.com

Front
Panel
I/O

PCIe
8

PCIe 3.0
Redriver
& Clk Buf

PCIe
8

XP1

XJ2

XJ3

XJ4

Backplane
CompactPCI® Express
PXI Express™

Peripheral Slot

## Board Assembly

2.5mm Front Bezel not Shown

2.5mm Front Bezel not Shown
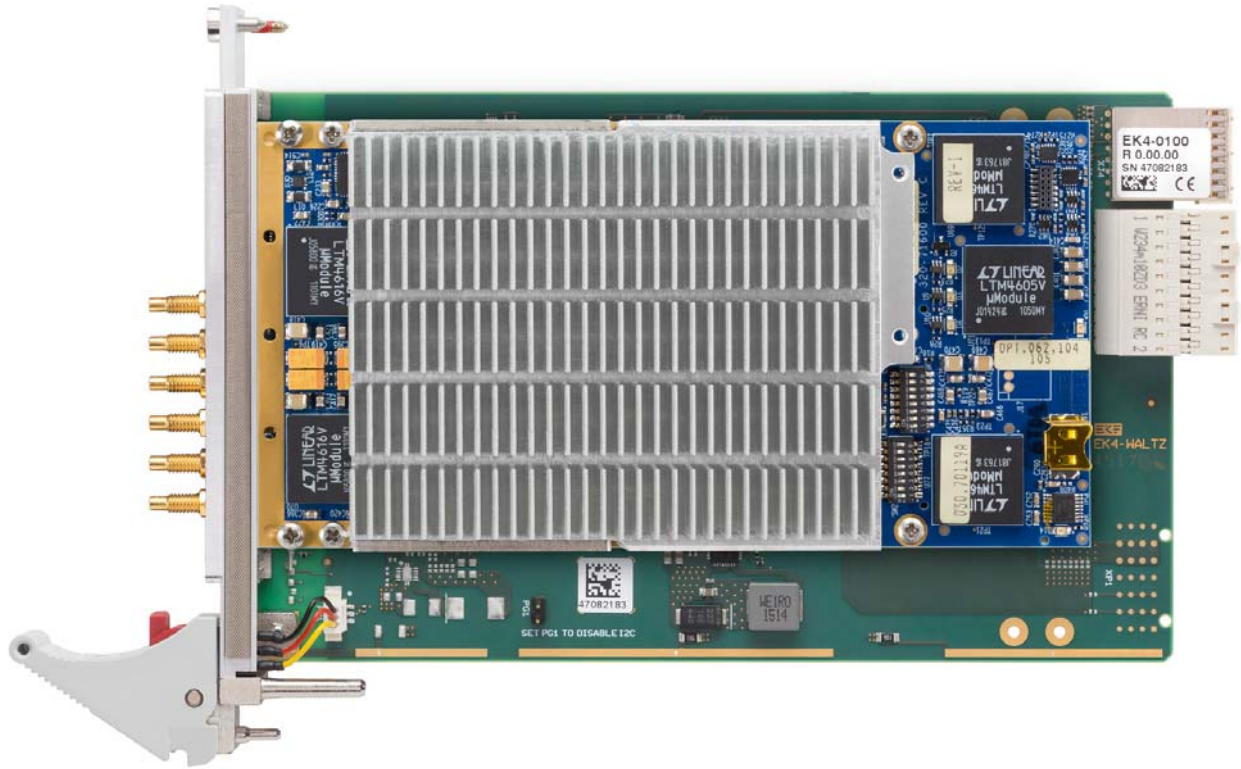
Front Panel

EK4-WALTZ

shaded area denotes a 2.5mm protruding covering plate

Please note: The front handle is provided with a built-in microswitch, which is used to disable the on-board power circuit when released. Vice versa, the *on-board devices are enabled not before the handle gets locked*. Please refer to the illustration below and make sure that the eject lever has reached its final position for proper board operation, as shown in picture 8. A gentle click should be audible, when the red actuator pin moves into its raised position, indicating that the board is locked and ready for use.
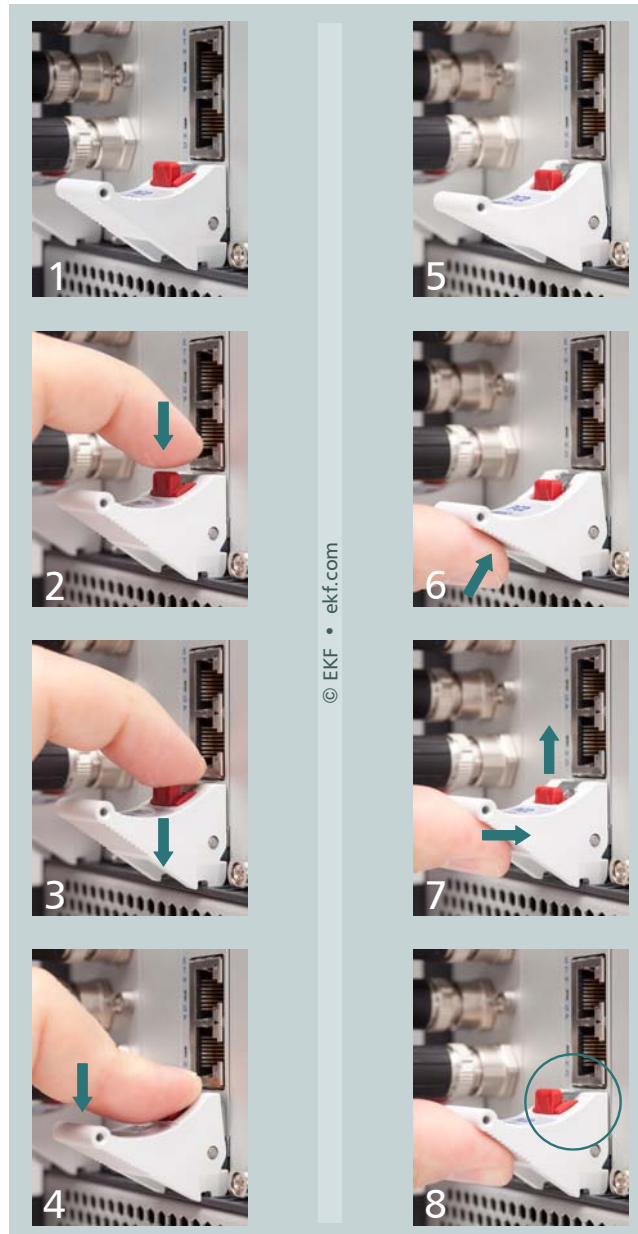
1 - 4: remove board
5 - 8: install board

1 & 8: on-board power enabled
2-7: on-board power disabled

XMC Socket J15

ANSI/VITA 42.3 defines a primary **XMC** connector, which is mandatory for PCIe fabric. The secondary XMC connector is optional (either fabric or user I/O).

The EK4-WALTZ is an XMC carrier board with a 8-Lane PCI Express® host interface, which is wired through the primary connector XMC J15. A secondary connector is not provided.
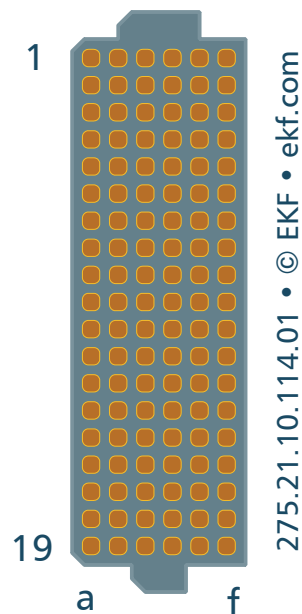
XMC Receptacle

CompactPCI® Serial cards are supplied by +12V only. This voltage is therefore used to fed the XMC connector J15 VPWR pins, across a power FET which is turned on when the front panel microswitch is activated (ejector lever position up = card locked). A switching regulator on the EK4-WALTZ provides +3.3V up to 3A to the XMC connector J15 3.3V pins. In addition, -12V can be generated by an optional inverting regulator.

As an option, the EK4-WALTZ can be equipped with a **XMC 2.0** type connector J15, as specified by VITA 61.0. With MIL/Aero environment in mind, the new connector incorporates a number of features for improved mechanical performance, and has been electrically characterized to support 5GHz+ allowing PCI Express® 2.0 (the VITA 42 connector in contrast has only been characterized to 3.125 Ghz). Since XMC (VITA 42) and XMC 2.0 (VITA 61) connectors are not intermateable, both the XMC carrier card and the XMC module must be populated with the same type of connector. The VITA 61 XMC 2.0 connector housing is off-white in colour as a visual key to differentiate it from the black VITA 42 legacy connector. Please specify your needs to sales@ekf.com when ordering the EK4-WALTZ.
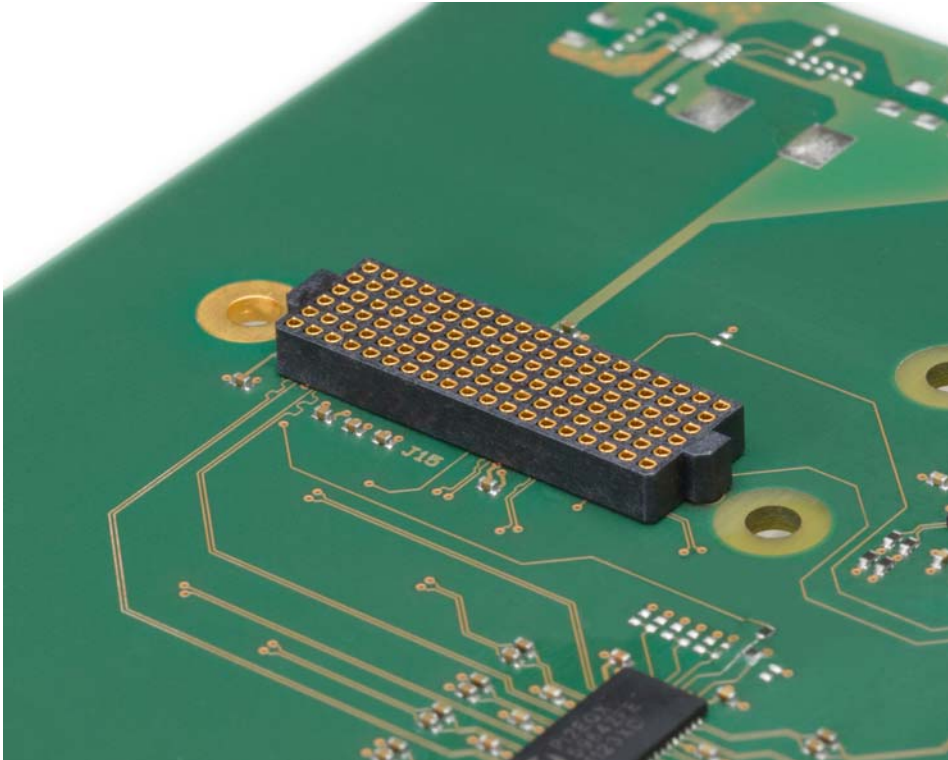
Classic J15 XMC Connector
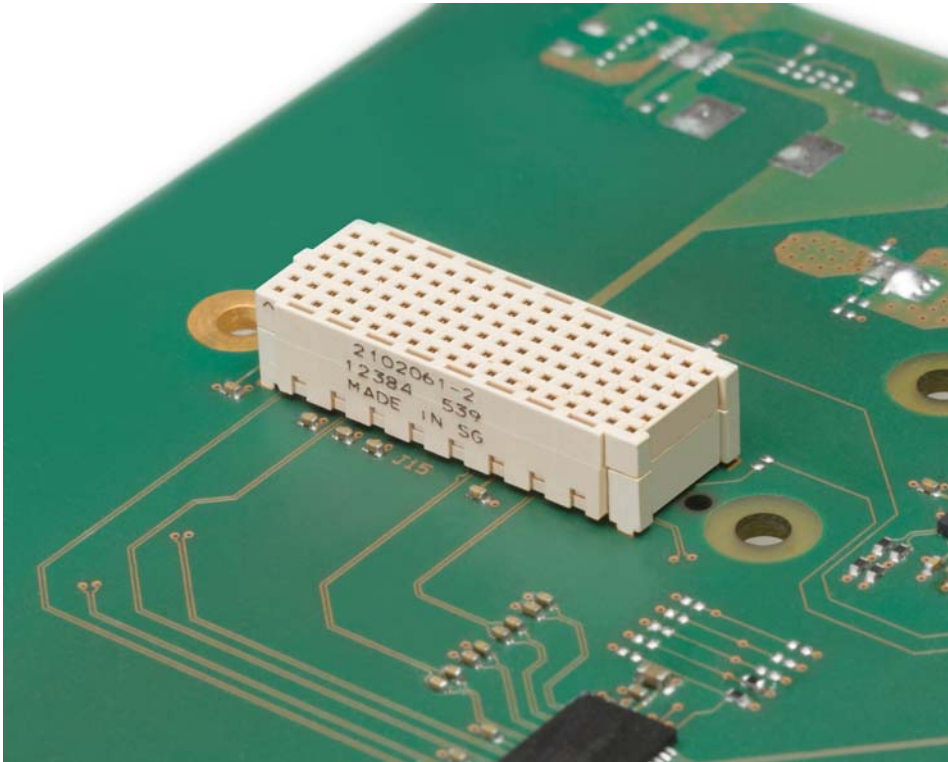
Advanced J15 XMC 2.0 Connector (Option)

XMC Connector J15 - PCIe Fabric • EKF Part No. 275.21.10.114.01					
	a	b	c	d	e	f
1	PET0P0	PET0N0	+3.3V 2)	PET0P1	PET0N1	+12V VPWR 1)
2	GND	GND	TRST# 11)	GND	GND	MRSTI# 6)
3	PET0P2	PET0N2	+3.3V 2)	PET0P3	PET0N3	+12V VPWR 1)
4	GND	GND	TCK	GND	GND	MRSTO# 7)
5	PET0P4	PET0N4	+3.3V 2)	PET0P5	PET0N5	+12V VPWR 1)
6	GND	GND	TMS	GND	GND	+12V VPWR 1)
7	PET0P6	PET0N6	+3.3V 2)	PET0P7	PET0N7	+12V VPWR 1)
8	GND	GND	TDI	GND	GND	-12V 8)
9	RFU	RFU	RFU	RFU	RFU	+12V VPWR 1)
10	GND	GND	TDO	GND	GND	GA0 3)
11	PER0P0	PER0N0	MBIST#	PER0P1	PER0N1	+12V VPWR 1)
12	GND	GND	GA1 3)	GND	GND	MPRESENT# 9)
13	PER0P2	PER0N2	+3.3V 4)	PER0P3	PER0N3	+12V VPWR 1)
14	GND	GND	GA2 3)	GND	GND	MSDA 10)
15	PER0P4	PER0N4	RFU	PER0P5	PER0N5	+12V VPWR 1)
16	GND	GND	MVMRO 5)	GND	GND	MSCL 10)
17	PER0P6	PER0N6	RFU	PER0P7	PER0N7	RFU
18	GND	GND	RFU	GND	GND	RFU
19	CLKP_XMC	CLKN_XMC	RFU	WAKE#	ROOT0#	RFU

pin positions printed italic/gray: reserved by specification / not connected

1) +12V XMC VPWR derived from +12V backplane connector pins XJ4/XP1 via FET power switch 18A

2) Sourced by on-board regulator +3.3V/7.5A

3) GA2 GA1 GA0 (I2C address assigned to module) strapped to 1 0 1 by default

4) Module +3.3V AUX tied to +3.3V rail

5) MVMRO (Module Volatile Memory Read Only) is an optional input to the XMC module, connected to an on-board GPIO (port 4)

6) MRSTI# (Module Reset Input) tied to platform reset

7) MRSTO# (Module Reset Output) is an optional output by the XMC module, connected to an optional on-board GPIO (port 5)

8) -12V is provided by the EK4-WALTZ as an option only (inverting regulator, -12V 0.2A)

9) MPRESENT# (Module Present), connected to an on-board GPIO

10) MSCL/MSDA derived from backplane connector XJ3 SMBCLK/SMBDAT via I2C switch (port 2)

11) 10k to GND - JTAG I/F not in use

CompactPCI® Express Backplane Connectors

The EK4-WALTZ is equipped with two connectors XJ3 and XJ4, which are mandatory for CompactPCI® Express Type 2 and PXI Express™ peripheral slot cards, and the optional power connector XP1, which is specified for Type 1 CompactPCI® Express peripheral slots.

XP1

Universal Power Module (UPM) Connector EKF Part #264.06.007.10	
XP1	Power Rail
G	GND
F	+12V
E	+12V
D	GND
C	+5V
B	+3.3V
A	GND

pin positions printed grey are not connected

XP1 will be provided as an option, for XMC module high power requirements. Each UPM blade contact is rated at 15A. However, XP1 may collide with legacy type backplane connectors in a chosen PXI Express™ backplane slot. Please check your needs before ordering.
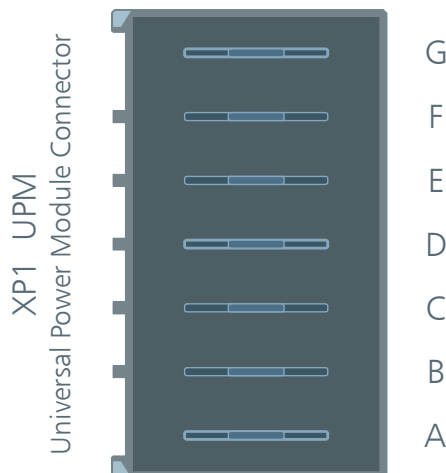
264.06.007.10
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XJ3

XJ3	A	B	C	D	E	F
	Advanced Differential Fabric (ADF) Connector • EKF Part #250.2.0310.10.01					
1	RSV *PXIe_CLK100+*	RSV *PXIe_CLK100-*	RSV *PXIe_SYNC100+*	RSV *PXIe_SYNC100-*	RSV *PXIe_DSTARC+*	RSV *PXIe_DSTARC-*
2	PRSNT#	PWREN#	RSV *PCIe_DSTARB+*	RSV *PCIe_DSTARB-*	RSV *PCIe_DSTARA+*	RSV *PCIe_DSTARA-*
3	SMB_DAT	SMB_CLK	RSV	RSV	RSV	RSV
4	MPWRGD	PERST#	RSV	RSV	1REFCLK+	1REFCLK-
5	1PETP0	1PETN0	1PERP0	1PERN0	1PETP1	1PETN1
6	1PETP2	1PETN2	1PERP2	1PERN2	1PERP1	1PERN1
7	1PETP3	1PETN3	1PERP3	1PERN3	1PETP4	1PETN4
8	1PETP5	1PETN5	1PERP5	1PERN5	1PERP4	1PERN4
9	1PETP6	1PETN6	1PERP6	1PERN6	1PETP7	1PETN7
10	RSV	RSV	RSV	RSV	1PERP7	1PERN7

all signals printed grey are NC • *all signal names printed italic are specified for PXI Express™*
all differential pair shield pins ab(1-10), cd(1-10) and ef(1-10) are tied to GND


XJ2 / XJ3 ADF
Advanced Differential Fabric Connector
250.2.0310.10.01
© EKF   ekf.com

XJ4

XJ4	A	B	C	D	E
Enriched Hard-Metric (eHM) Connector • EKF Part #250.1.0508.10.02					
1	GA4 1)	GA3 1)	GA2	GA1	GA0
2	+5V_AUX	GND	SYSEN#	WAKE#	ALERT#
3	12V	12V	GND	GND	GND
4	GND	GND	3.3V	3.3V	3.3V
5	I/O *PXI_TRIG3*	I/O *PXI_TRIG4*	I/O *PXI_TRIG5*	GND *PXI_GND*	I/O *PXI_TRIG6*
6	I/O *PXI_TRIG2*	GND *PXI_GND*	ATNLED	I/O *PXI_STAR*	I/O *PXI_CLK10*
7	I/O *PXI_TRIG1*	I/O *PXI_TRIG0*	ATNSW#	GND *PXI_GND*	I/O *PXI_TRIG7*
8	I/O *PXI_RSV*	GND *PXI_GND*	I/O *PXI_RSV*	I/O *PXI_LBL6*	I/O *PXI_LBR6*

all signals printed grey are NC • *all signal names printed italic are specified for PXI Express™*

1) either backplane signal GA3/GA4 ≠ 0 (backplane slot >8) will disable the internal I2C circuitry

250.1.0508.10.01
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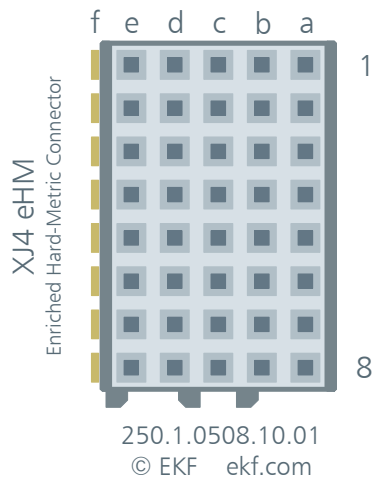
The XJ4 connector is mechanically coded either for pure usage with CompactPCI® Express (F1 key) or PXI Express™ (F2 key). By default, the F2 connector is populated, since it can be inserted into both types of backplane connectors XP4. Illustrated above is the F1 keyed connector.

EK4-WALTZ Links	
EK4-WALTZ Home	www.ekf.com/e/ek4/ek4.html

Related Links	
SK2-SESSION Home CompactPCI® Serial • XMC PCIe x4	www.ekf.com/s/sk2/sk2.html
SK3-MEDLEY Home CompactPCI® Serial • 139mm XMC PCIe x8	www.ekf.com/s/sk3/sk3.html
SK4-WALTZ Home CompactPCI® Serial • 149mm XMC PCIe x8	www.ekf.com/s/sk4/sk4.html
CompactPCI® Serial Overview	www.ekf.com/s/smart_solution.pdf

Ordering Information
For popular EK4-WALTZ SKUs please refer to   www.ekf.com/liste/liste_23.html#EK4

XMC Mezzanine Modules from EKF		
XMC Overview		www.ekf.com/d/xmc_concise.pdf
DB4-EAGLE	USB 3.0	www.ekf.com/d/dusb/db4/db4.html
DC2-STAG	PCIe Cabling	www.ekf.com/d/dpxc/dc2/dc2.html
DN1-PIKE	GbE	www.ekf.com/d/dnic/dn1/dn1.html
DN3-SHARK	10GbE	www.ekf.com/d/dnic/dn3/dn3.html
DS1-LEOPARD	SAS	www.ekf.com/d/dsas/ds1/ds1.html
DU1-MUSTANG	RS-485 iso	www.ekf.com/d/dcom/du1/du1.html
DU2-PONY	RS-232 iso	www.ekf.com/d/dcom/du2/du2.html
DV1-DRAGON	VGA/DVI	www.ekf.com/d/dgxa/dv1/dv1.html
DX2-COUGAR	SATA	www.ekf.com/d/dide/dx2/dx2.html
DX4-BADGER	mSATA	www.ekf.com/d/dide/dx4/dx4.html
DX5-ANT	M.2 SATA	www.ekf.com/d/dide/dx5/dx5.html

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